Criteria for Blood Transfusions

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• **A review of the use of blood transfusions used in a small community hospital over a two-year period revealed a high incidence of instances in which the clinical record did not show essential need for the procedure. Educational efforts in hospital staff meetings resulted in some improvement in this respect during the two-year period. Of single unit transfusions given during the first year, 80 per cent were deemed to have been nonessential; during the second year, 52 per cent.**

Methods which will reduce the use of blood except when it is essential are (1) continuation of staff education; (2) providing the staff with accurate methods of measurement of blood volume and of monitoring blood loss; (3) use of a separate blood transfusion chart in the patient's hospital record; and (4) establishment of a hospital transfusion committee to review the criteria in all cases in which blood is transfused.

THE MORTALITY from blood transfusions ranks with that from appendicitis or anesthesia. Approximately 3,000 deaths result from the 3.5 million transfusions given each year in the United States.[2] In light of the accumulating evidence of hazard, the possible benefit must be weighed against the danger in each case. It is apparent therefore that more exact definition of criteria for blood transfusion should be established in the minds of physicians. Recognition that there are medical and legal hazards involved in the use of blood transfusions stimulated the authors to make a study of the use of blood in a 100-bed community hospital over a two-year period.

Objectives of this project were: (1) To see how often blood was transfused when it was not truly essential; (2) to provide educational data to the medical staff on the subject of indications and dangers of blood transfusions; (3) to stimulate the use of improved scientific methods as an aid in the determination of the necessity for use of blood transfusion; and (4) to establish mechanisms of improved controls in the use of blood transfusions if the study should show the controls were needed.

METHOD

A survey of blood transfusions administered in a 100-bed hospital over a one-year period (1959-1960) was made by a two-man team using medical, surgical, obstetrical, anesthetic and laboratory records from patients' hospital charts. One-unit, two-unit and three or more unit transfusions were compared by incidence and apparent need. Results of this survey were presented to the hospital medical staff in conjunction with a program designed to emphasize the indications, contraindications and complications of blood transfusions. A second one-year survey (1960-1961) was then begun and verbal references to this study were repeated at monthly hospital staff meetings to maintain continued awareness of the problems related to blood transfusions. Results of the two periods were then compared.

The transfusions of this study were divided into three groups, one-unit, two units, and three or more units. Each of these groups was further subdivided into three categories—emergency, homeostasis, and nonessential—according to the apparent indications for transfusion as determined from analysis of the clinical records. The "emergency" group included all transfusions deemed necessary to preserve life by supporting circulating blood volume and/or enhancing oxygen-carrying capacity, and also all transfusions used in cases of acute, uncontrolled loss of blood in which the extent of the immediate loss and the probable further loss could not be estimated. Excluded from this group were cases in which oxygen-carrying capacity was considered to be adequate and the circulating volume could have been restored by using plasma expanders. The cases grouped under "homeostasis" included those in which blood transfusion was not an emergency procedure but was necessary to maintain health, a plasma expander being inadequate. This group included use of blood in supporting patients with uremia, leukemia or wasting and neoplastic diseases. Cases in which a plasma expander could have been used instead of blood if the circulating volume had to be increased were included in the "nonessential" group. This category also included cases in which indications for blood transfusions were not stated in the patient's chart and were not recognized upon review of the clinical record. Some 48 per cent of the series were so classified.

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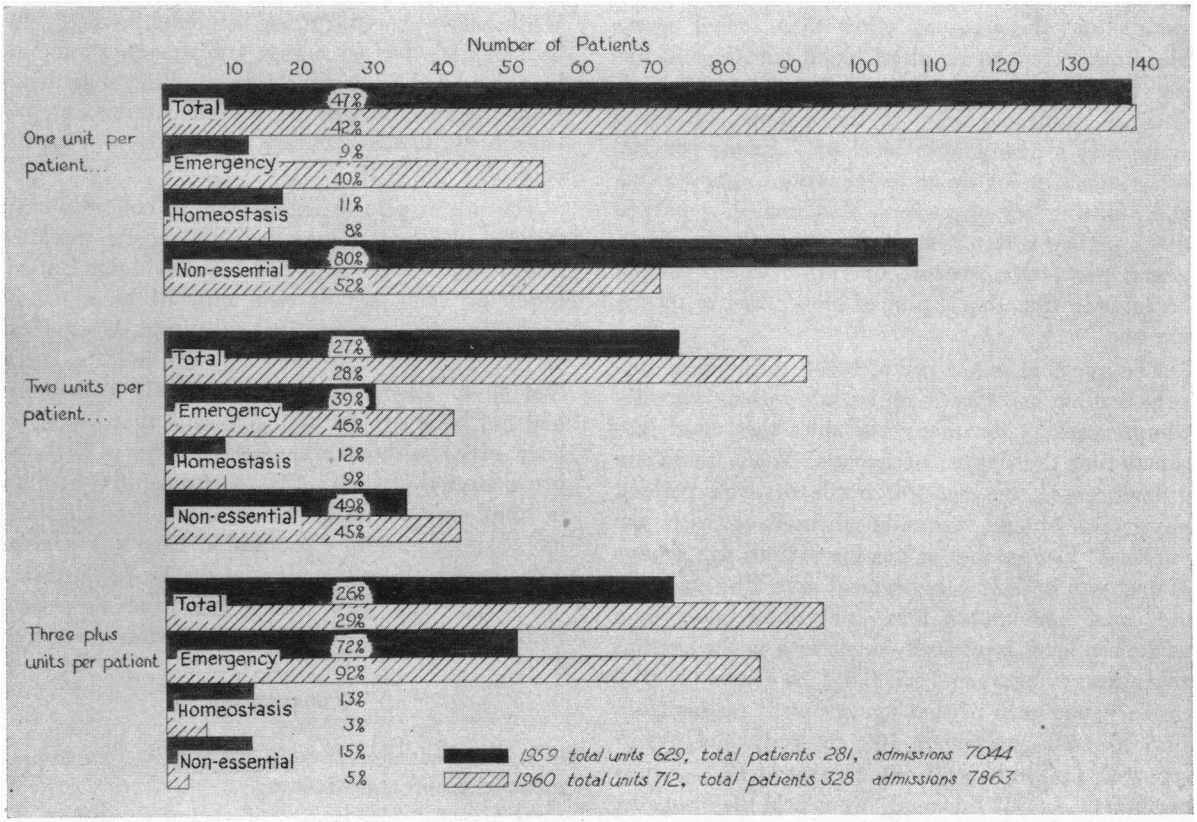

Chart 1.—Transfusions in three categories (one unit, two units, three or more units) related to three classifications of need for blood (emergency, homeostasis, nonessential) as determined from review of records over a two-year period.

RESULTS

In the first of the two years reviewed, single unit transfusions made up 47 per cent of the total; in the second year, 42 per cent. Of the single unit transfusions, 9 per cent of the first year's and 40 per cent of those in the second year were deemed to have been of an "emergency" nature and therefore essential, indicating an improvement in standards for the use of blood transfusions between the first year and the second. Improvement of this order also occurred in the two-unit and in the three or more unit groups. (See Chart 1.)

DISCUSSION

For the most part the justifiable purposes of blood transfusions are: (1) To maintain or increase the volume of circulating blood; (2) to improve or maintain the oxygen-carrying capacity of circulating blood; (3) to replace toxic circulating blood, i.e., exchange transfusion; and, (4) to enhance blood coagulation. In most instances the use of blood for maintaining or increasing the circulating volume should be reserved for cases requiring two or more units. It has been observed that acute losses of 1,000 to 1,500 cc. of blood in previously normal adults can be compensated by use of plasma expanders if bleeding can be stopped.[7] Since spontaneous reestablishment of hemoglobin begins soon after bleeding in most cases, the amount increasing approximately 0.1 to 0.3 grams per 100 cc. per day,[5] the patient can be expected to be considerably improved by the time of discharge, without ever having had blood by transfusion.

Some surgeons have expressed the view that healing will be more rapid if hemoglobin levels are maintained within the normal range, but the authors know of no convincing evidence in support of this belief. Many surgeons and anesthetists believe that a long operation is in itself an indication for whole blood transfusion, that all patients with symptoms of shock and blood loss need whole blood and that it is unsafe for a mildly anemic patient to have a major operation without previous transfusion of blood to elevate the hemoglobin. Many also believe they are quite accurate in estimating the loss of blood during an operation. In general, these are misconceptions. Wilson and Adwan[9] reported that of 100 consecutive patients with benign ulcers of stomach, duodenum or gastroenteric stoma undergoing elective partial

gastrectomy for reasons other than recent severe bleeding, only two required blood transfusion during the operation and none needed it afterward. Crosby[1] indicated that if the volume of blood is normal a hemoglobin level of 7 grams per 100 cc. is sufficient for tissue oxygenation in most situations during an operation. Macdonald[4] remarked that a patient with a hemoglobin concentration of 11 grams per 100 cc. before operation would usually be safer in donating a pint of blood than in receiving one.

The question of the use of blood to improve oxygen-carrying capacity in an anemic patient is greatly complicated by the many variables that enter into calculating the degree of anemia. While there are differences in the specific needs of each patient, physicians should acquaint themselves with the "normal" hemoglobin values for various age groups of each sex in their geographical area. For example, the usual hemoglobin level for young housewives in the sea level community dealt with in the present study ranges between 10.5 and 13.5 grams per 100 cc. In young men of that age group it ranges from 12.5 to 16.0 grams per 100 cc. Judy and Price[3] reported a mean hemoglobin content of 12.55 grams per 100 cc. in 663 "normal" women in the Spokane, Washington, area which is at an altitude of about 2,000 feet. It should be emphasized that a single unit of blood will increase the hemoglobin only 1.0 to 1.5 grams per 100 cc.[5]

The possible benefit must be weighed against the hazards—hepatitis, bacteremia, transfusion reaction, allergic reaction, sensitization. Anemia not connected with surgical operation or traumatic bleeding is also sometimes an indication for transfusion. However, again considering the hazards, it is often advisable to allow enough time for hematopoiesis to make up the deficit under appropriate therapy. Indeed, transfusion is seldom necessary in the treatment of "medical" anemia. The usual changes in hemoglobin levels during and following pregnancy should be borne in mind, for giving whole blood in such circumstances may set the stage for subsequent transfusion reactions or erythroblastosis fetalis. Special hazards attend the use of blood transfusion to treat anemia in patients with such complicating conditions as congestive heart failure, myocardial infarction, hypertension and hepatic coma.

Inaccurate hemoglobin determination can lead to prescribing blood where it is not essential. In one hospital where an error of 2.0 grams (low) was being reported by the laboratory an estimated 1,000 patients in a one-year period were given transfusions that otherwise would not have been prescribed.[5] While office procedures for hemoglobinometry may be adequate for screening, transfusion should not be considered in any elective situation until hemoglobin determinations have been carried out by a laboratory using accurate standards and quality control.

The use of plasma substitutes for colloidal maintenance of blood volume does not receive the attention it deserves. Sayman and Allen[7] said that patients requiring only one or two units of blood should probably receive a colloidal substitute. Morton[6] observed from data obtained in a six months survey that 34 to 72 per cent of single unit transfusions had not been essential. He believed that blood had been given without adequate reason: (1) To improve wound healing; (2) to replace loss of blood in small amounts; (3) to relieve emotional instability; (4) because of hypotension clearly associated with anesthetic or analgesic drugs; (5) during operation, and, (6) before operation to patients with anemia, most of whom had iron deficiency.

CONCLUSIONS

1. Further education is needed in the employment of blood transfusions.

2. A rapid, practical, inexpensive method for determination of blood volume and to monitor blood loss. This requirement is met in our laboratory by the use of the "Volemetron,"*[8] employing radioactive iodine-labeled albumin.

3. A standard blood transfusion chart should be available for the patient's hospital record. This is necessary because often there is no adequate record of data that later can justify the use of blood transfusions. Although the need for this therapy may have been apparent to the physician at the time, the absence of an adequate record might result in a dire legal complication should damage to the patient result from the use of blood. The separate record sheet may serve as a reminder to the physician of the dangers of blood transfusion and also be of value later should there be need to review the record.

4. Hospitals should have transfusion review committees to: (a) review records for indications in cases in which transfusions are used; (b) support and encourage educational efforts in the proper use of blood transfusions; and, (c) maintain vigilance over laboratory methods of hemoglobinometry, blood typing, cross-matching, and the handling and identification of blood to insure accurate reports and maximum safety from laboratory error.

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*The "Volemetron," manufactured by the Atomium Corporation, Waltham, Massachusetts.

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